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A

THIRD DISSERTATION

ON

QUICK-LIME

AND

LIME-WATER.

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EDINBURGH:
Printed by SANDS, DONALDSON, MURRAY, and COCHRAN.
Sold by G. HAMILTON and J. BALFOUR.
MDCCLVII.

BRITISH MUSEUM
30 MAY 61

PREFACE.

THE following Diſcourſe was finiſhed in *October*, and would have been then publiſhed, had I not received imperfect Accounts of the Succeſs of Lime-water in ſome more Caſes, eſpecially arthritic: And being now ſufficiently informed of the Circumſtances, I ſhall here give two or three more pretty remarkable Caſes, to be added to the eleven in the Diſſertation.

Caſe 12. A Gentleman of a ſound Conſtitution, and healthy, till about forty Years old, became then ſubject to the Gravel in the Kidneys; and having laboured under it for one Year, was alſo ſeized with the Gout; both which Diſeaſes he ſeemed to have derived from his Father, who ſuffered much by them. This, as well as the exceſſive Pain, made him very apprehenſive and abſtemious, and readily follow all the Directions given him; but all to no Purpoſe. At length, after having for a long Time paſſed Blood with his Urine, which the ſmalleſt Motion increaſed, and ſuffered exceſſive Pain, a large Stone came away, as did ſeveral others afterward, with leſs Trouble. The Gout began in the firſt Joint of his big Toe, accompanied with the uſual Symptoms, every Paroxyſm almoſt increaſing in Strength; until, by theſe Diſeaſes, and living almoſt entirely on Bread and Water for about five Years, he became very weak, being reduced to Skin and Bones; when his Doctor, who was alſo troubled with the Gravel, having ſeen one of the Diſſertations on Quick-lime and Lime-water, and given it his Patient to read, both determined to have Recourſe to this Liquor. The Patient, having a Fit of the Gout on him at the Time, began immediately to drink it, taking two or three Gills Morning and Evening; the Effect whereof, he ſays, was really miraculous. For notwithſtanding his accurate Diet, and the Eaſe and Warmth wherewith he indulged his

Feet, the Pain, Inflammation, and Swelling, affected them to above his Ancles. But he had not drank the Lime-water for two Days, when the Pain ſenſibly abated by Degrees, and with it the Inflammation and Swelling; leaving firſt the Ancles, then the Parts below, and ſo gradually deſcending, till, in a few Days Time, all the Symptoms of the Gout were driven, as he expreſſes it, out at the Point of his big Toes, by the Lime-water. Beſides the Gravel and Gout, before he drank the Lime-water, the leaſt Motion gave him a great Difficulty of breathing, and Palpitation at his Heart: He had no Appetite for Meat, and a very bad Digeſtion; every thing turning ſour in his Stomach, though he never taſted any fermented Liquor. He was alſo troubled with the Scurvy. But the Lime-water has freed him of them all. He can take a Glaſs of Wine freely, and has a good Appetite, as well as Digeſtion. He does not continue the Uſe of Lime-water when in good Health; but whenever he becomes any way uneaſy or apprehenſive, he has immediate Recourſe to his favourite Lime-water, which ſoon reſtores him to perfect Soundneſs. Thus, about eighteen Months ago, he was attacked with a Giddineſs and Heavineſs of the Head, or a ſlight Vertigo; which the Lime-water ſoon removed. To prevent Coſtiveneſs, when he drinks Lime-water, he commonly diſſolves in it ſome *Spaniſh* Sope. In a Word, notwithſtanding ſuch a Complication of Diſeaſes, he is now at fifty Years of Age, a luſty vigorous Man, and eats and ſleeps as well as ever. He tells me he has now commenced Doctor himſelf, and cured many; and particularly a Neighbour of his; who, complaining of the Gout, and of the Loſs it was to him in his Buſineſs, told him he would cure him for Twopence, and was better than his Word. This Caſe I had from the Gentleman's own Mouth, the 5th of *December* 1757.

Caſe 13. A Gentleman of a clean and ſpare, rather than plump Habit of Body, and commonly very temperate, though now and then taking a cheering Glaſs; after a long State of great Health, in *October* 1747, being about ſixty Years old, was ſurpriſed one Evening with a violent Pain in one of his Feet, which he ſoon found to be the Gout, which confined him no leſs than thirteen Weeks. He then gave over drinking all ſpirituous Liquors, except Claret, and had not another Fit till *July* 1750, which continued but ſix Weeks. After three or four more ſuch painful and long Paroxyſms, (out of which he always recovered ſlowly), the laſt whereof began in *March* 1757, confined him for two Months, and left him exceſſively weak, he determined to lay aſide his Claret, and make Trial of Lime-water, hoping thereby ſooner to recover his Stomach and Strength. He began to drink it the 15th of *Auguſt*, taking half an *Engliſh* Pint twice a-day; and its Succeſs has exceeded his Hopes: For he has recovered his Strength much ſooner after this, than after any former Fit; he eats and ſleeps well; and, which he takes particular Notice of, he has not known what it is to be thirſty ever ſince he drank the Lime-water, though he was made believe that it would increaſe Thirſt. Which calls to mind what a learned Phyſician, of great Practice in the Country, wrote to me in *May* 1756; who, among other Things, ſays, "I have now experienced Lime-water to be the moſt effectual quenching, refreſhing, and compoſing Drink, in Fevers." Yea, in my own Experience, as well as that of others, I have found it more cooling and quenching by far than common Water. And to conclude, our arthritic Gentleman finds ſo much Benefit from the Lime-water, that he is reſolved to continue the Uſe of it, which it is hoped will prevent the Return of any more Paroxyſms. It was my complimenting him on his more than ordinary good Looks that procured me this Account of his Caſe, *December* 16. 1757.

Caſe 14. A ſtrong and vigorous Gentleman, when about thirty Years old, being engaged in a Match at that violent Exerciſe called the *long Bullets*, and exerting his utmoſt Strength to throw beyond his Antagoniſt, found as it were a Prick in his Stomach, as if he had received a Wound by a pointed Inſtrument. Ever ſince that Misfortune, which is more than ten Years, he has had a Pain there, and been in a very bad State of Health, having tried various Remedies, and among others the Goat-whey; but all in vain. In the Beginning of *July* laſt he was attacked with a bloody Flux, daily voiding a great deal of Blood; not liquid, but congealed, as if it had lodged for ſome time in his Guts. In this State he has continued for near five Months, without Intermiſſion, or any Change to the better. For although the *vitrum ceratum antimonii* bound him up, yet his Stomach ſwelled, and in two or three Days the Flux violently returned. On the 14th of *November* laſt the Miniſter of the Pariſh viſited him, and finding him greatly emaciated, complaining of Thirſt, want of Appetite, *&c.* and of the melancholy Proſpect he had of the Winter, adviſed him to try Lime-water, taking at firſt half an *Engliſh* Pint in the Morning, and as much any Time of the Day he inclined, aſſuring him that it could do no harm. "He followed my Advice," ſays the Miniſter; "and the Succeſs has exceeded our Expectation; the Symptoms are all abated; he has " paſſed very little Blood ſince the 15th of *November*, " when he began to drink the Lime-water; he ſleeps " well, begins to recover his Appetite; from thirteen " is brought to three Stools a-day, and is in great " Hopes of a perfect Recovery." On *December* 1. he thought himſelf quite well, having but one Stool a-day, as when in Health. But imprudently uſing ſome too violent Exerciſe, his Diſeaſe recurred, but not with its uſual Violence, and was better on the 5th. He reſolves to continue the Remedy with more Caution, and expects a complete Cure. Extracted from two Letters from the ſaid Miniſter, dated *Nov.* 21. and *Dec.* 5. 1757.

EDINBURGH, *Dec.* 20.
1757.

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A

A
THIRD DISSERTATION
ON
Quick-Lime and Lime-Water.

LIme-water has of late been found ſo efficacious a Remedy, in the moſt obſtinate Diſeaſes, for which it is recommended in the former Diſſertations, that not to make a few of them more generally known, would be an inexcuſable Omiſſion. The Credit of a Medicine ſo eaſy to be had, and which coſts, in a manner, nothing, is difficultly eſtabliſhed, and yet more difficultly kept up; People generally rating Things according to their Price; though nothing can be more faulty in Phyſic. It is certainly the moſt valuable Remedy which produces the moſt ſalutary Effects; and the more common it is, it is ſo much the better. Thus obliged again to take up the Pen, I muſt alſo be allowed to make ſuch Additions as may further illuſtrate the Subject. I ſhall therefore, *1mo*, give ſome Inſtances of the Succeſs of Lime-water in ſeveral ſtubborn Diſtempers; *2do*, Explain more fully ſome Paſſages in the Diſſertations; and, *3tio*, Having made a few Additions, *4to*, do Juſtice to ſome Criticiſms on theſe Papers, which have lately come abroad.

1. Of all the Cures performed by Lime-water, which I have either ſeen, or have been tranſmitted to me by others, I think thoſe contained in the following Letter, which a learned Phyſician has favoured me with, deſerve the moſt particular Attention. For however much the Diſcovery of ſome of the Virtues of Medicines, may be owing to what is called *Chance*, yet,

"By obſerving," ſays the Doctor, "their Effects in different Diſeaſes and Conſtitutions, many new Virtues in one and the ſame Medicine, have often been found out. And ſince you have found, and communicated to the Public, many of the ſalutary Virtues of Lime-water; to you it cannot be diſagreeable to mention the following, which have occurred to me. Not that I fancy, or infer from thence, that Lime, or any other Medicine, will be found catholic, or infallible in every ſimilar Caſe. If it gives Relief but to a few of many Diſtreſſed, how valuable ſuch a Remedy, where the Trial is neither hazardous nor expenſive?

2. *Caſe* 1. "A Gentleman, now 44 Years old, naturally of an athletic healthy Conſtitution, which from his Infancy he had uſed with the greateſt Freedom, until of late Years he came to be grievouſly tormented with violent Pains in the Region of his Stomach and Sides; which, after repeated Evacuations by bleeding and bliſtering, ſhifted from the Sides to the Extremities, and terminated at laſt in a fixed Gout, for twelve Weeks, and brought him very low. After ſo long Confinement, he was ſeized with nephritic Complaints, and flying goutiſh Pains in his Body. He paſſed ſeveral ſmall Stones and Sand, with a good deal of Pain; for which he was ordered proper Diet and Exerciſe, with a Courſe of Lime-water, which for two Years was his conſtant Drink, to the Quantity of four or five Pounds Weight in twenty-four Hours. All laſt Year he was able, and did often ride after the Hounds in full Chace; and has now recovered Spirits, Strength, and Looks, as good as ever; with no Complaint of Gout for two Years, or Gravel for twelve Months paſt: And though lately, for ſix Weeks, he lived fully, and drank freely, ſometimes to Exceſs; as yet he has felt no bad Effects of it. The Gentleman himſelf alſo obſerves, that he was much more afflicted with the Scurvy, before he drank the Lime-water, than he is now.

3. *Caſe* 2. "Another Gentleman, about 50 Years of Age,

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Age, of a robuſt Habit of Body, was, laſt Winter and Spring, threatened with a deep Conſumption; for which he uſed Tar-pills in great Quantities, and drank Lime-water from a Bottle to two Bottles a-day. He now finds himſelf in better Health and Spirits than at any Time for twenty-four Years paſt, that he was firſt ſeized with the Gout. He uſed to have long and violent Paroxyſms, both Autumn and Spring, for fourteen Years ſucceſſively. He is now free of all goutiſh Pains and Rheumatiſm, as well as of every phthiſical Symptom, which he had not been for many Years. His Appetite and Digeſtion are remarkably better.

4. *Caſe* 3. " Another Gentleman, above 60 Years old, who, from Anxiety in domeſtic Affairs, had his Mind greatly and frequently diſquieted, and often altogether void of Reaſon; after the laſt Attack of that kind, was ſeized with a nephritic Complaint, and paſſed a ſmall Stone; which occaſioned his being put on a Courſe of Lime-water, with a proper *Regimen*. Since that Time, which is three Years ago, he has been quite well, has recovered his Looks and Fleſh, without the leaſt Return of low Spirits, and is as diſtinct and fit for Buſineſs as ever. Having obſerved, as is often the Caſe, that when his Head was affected, his Stomach was always loaded with Phlegm, and nothing relieved him ſo much, as throwing it up by Muſtard Vomits; from thence I conjectured, that Lime-water had done him remarkable Service, by preventing ſo much Phlegm's being generated in the *primæ viæ*; and hoped it might be of Uſe in the ſame Complaints, though from different Cauſes. Nor was I diſappointed in my Expectations of Succeſs, in the two following Caſes.

5. *Caſe* 4. " A young Lady, about 30 Years of Age, who had been irregular as to her *Menſes* for a long Time, and changing the Exerciſe and free Air of a Country-life, for a ſedentary and confined one in Town, ſoon complained of Pains affecting her in various and extraordinary Shapes; for which ſhe got a great Va-

riety of nervous, deobſtruent, and emmenagogue Medicines, to little Purpoſe; till at laſt her Head and Judgment were frequently affected, yea quite diſordered. About twelve Months ago, in an Attack of that kind, after proper Evacuations, and other Medicines, the Diſtemper ſtill continuing, I thought that Lime-water might be of Service, on the ſame account as in the preceding Caſe; and it ſoon had ſingular and ſurpriſingly good Effects. For although the Suppreſſion of the *Menſes*, the firſt Cauſe of the Diſeaſe, was not removed, her Spirits and Judgment have ever ſince been quite free and ſound.

6. *Caſe* 5. "A young Lady, above 30, who was ſeized five or ſix Years ago with regular Paroxyſms of a tertian Ague; as ſhe was of a weakly Conſtitution, ſhe had been twice before at the Gates of Death by that Diſeaſe: For though at firſt regular, it continued ſo long, and the Paroxyſms redoubled ſo faſt, as to leave little or no Interval betwixt them; and by that means the *Peruvian* Bark, and other Medicines, had little or no Effect. Obſerving therefore, that in all her Complaints ſhe was much troubled with Phlegm in her Stomach and Bowels, I thought of giving her Lime-water; which, after cleaning the *primæ viæ* by a Vomit and Purgative, had very good Effects. The firſt Fit, after uſing the Water, was milder than the former; the ſecond more ſo, and the third ſcarce perceptible. Since which Time ſhe has not had the leaſt Threatening of a Return; but, by uſing the Lime-water for two or three Days, it is carried off. I could add many more Inſtances; but ſhall give only one, of the Effects of Quick-lime itſelf.

7. *Caſe* 6. "A ſtrong robuſt young Country-fellow, about 20 Years of Age, was ſeized with an autumnal tertian Ague; for which he had taken many Things, and had checked it often with *Peruvian* Bark; but it as often returned. After proper Evacuations, I adviſed him to drink Lime-water; but he either could not, or would not drink a ſufficient Quantity of it. I there-

fore ordered him, before the Fit, gentle Doſes of calcined Oiſter-ſhells in Powder. He thought them ſo inſignificantly ſmall, that of himſelf he took a large Doſe; which indeed gave him ſuch a Pain in his Stomach, that he thought to have died of it. But from that Day to this, which is two Years, he has never had any more of the Ague, and been in perfect Health ever ſince. Adieu, D. D. and believe me to be your, *&c.*

Oct. 7. 1757. STEWART THRIPLAND."

8. *Caſe* 7. "The firſt Cauſe of my Trouble was a great Bruiſe on the Small of my Back, by a ſtumbling Horſe falling above me; for which I was under Dr *Dundas*'s Care from *February* 1753, while he lived. In *July* following I was ſeized with a kind of aguiſh Fever; my Urine and Skin became yellow, my Extremities ſwet much, and all my Nerves trembled ſo that it was not in my Power to hold a Spoon to my Head. This continued with me for three Years, notwithſtanding all Care was taken of me by Phyſicians; a great Pain ſtill continuing in the Small of my Back, till *February* 1757, when the Pain ſeized all my left Side, beginning at my Shoulder, and left Side of my Head, which ſwelled very big. Then I was bliſtered on the Shoulder, let Blood, and got Phyſic; yet the Pain paſſed over all my Side to my very big Toe, which likewiſe ſwelled; but no other Part ſwelled, but only the two Extremities: And I was ſo much pained for a Month's Time, that I could not put on nor off my own Cloaths; and when helped, it was with great Pain; till the 23d of *March*, that I began to drink the Lime-water, and drank above a Bottle every Day. The firſt Remark I made of it was, that it turned my Urine quite clear, for the Space of five Days; after which it turned it to its old Colour, yellow; but with a great Sediment, which it had not for near four Years before. Then I began to find Eaſe of all my Pains, attended with a good Appetite, which I had not for a long Time. I alſo made Trial, and left off drinking the Lime-water from the 14th Day of *May* to the 28th; when I found myſelf

turning ſomewhat uneaſy, and then fell to the drinking it again; of which I find great Benefit: For I have as great Agility of all my Body, as when but 20 Years old, though now 57. I was alſo ſore troubled with a Shortneſs of Breath, which has quite left me; and alſo the *Tremor* of my Hands, which much diſheartened me, fearing the Palſy. But, bleſſed be God, I have attained to a pretty good State of Health at preſent. This, with all thankful Acknowledgments, *&c.* from

June 18. 1757. ROBERT MURDOCH."

9. *Caſe* 8. *James Pollock,* a young Man of a ſound Conſtitution, till about 16 Years old, when he became very ſubject to Pains in his Stomach, ſometimes accompanied with Sickneſs and Vomiting, till he was about 19, and which, as he thinks, brought on him a more ſevere Trouble; for a violent Pain then ſeized his right Side, about the ſhort Ribs, ſtruck down to his Ancle, affected afterward his Shoulder, and, in a Word, it was not long before every Part of his Body had been roughly handled by it; ſometimes one Part ſuffering moſt, and ſometimes another, with now and then ſhort Intervals of Eaſe. In this State he continued ſome Months; during which Time he was thrice blooded, ſeveral times purged, by a Quack in the Neighbourhood, and the Parts anointed with *Dialthæa*; but all to no Purpoſe. His Pains, accompanied with burning Heat, Stiffneſs, and Swelling, increaſed, particularly in his Neck and Back; ſo that he could not hold up his Head, nor ſuffer a Cravat to be tied about his Neck, without being almoſt ſtifled for want of Breath; yea he ſaid the very moving his Eyelids increaſed his Pains. He had ſuffered thus about a Month, when he was directed to drink about a Bottle of Lime-water every Day. He followed the Advice, and found ſo much Eaſe the very firſt Night, that he commonly exceeded the preſcribed Doſe; and much to his Advantage; for the ſecond Night his Pains left him, and he thought himſelf quite well; but wiſely continued to drink the Lime-water for three Weeks. It is now three Years ſince he was cured: He

continues to enjoy great good Health, and is a vigorous young Man. One Thing more deſerves to be taken notice of; and that is, that he ſometimes drank the Lime-water a little muddy, or not quite fine, till the Uneaſineſs it created in his Stomach taught him to be more cautious. *July* 22. 1757.

10. *Caſe* 9. "A young Girl, about eight Years of Age, and of a pretty healthful Conſtitution, was ſeized with very troubleſome cuticular (commonly called *ſcorbutic*) Eruptions, of the dry ſcabby kind, in different Parts of her Body, particularly upon her Legs and Thighs, where there were ſome almoſt as broad as the Palm of one's Hand. To remove this Indiſpoſition, which had continued for ſeveral Months, ſhe uſed mercurial Purgatives, Æthiops Mineral, *Sal Polychreſt*, and Sea-water: All which, in place of removing her Diſorder, ſeemed rather to increaſe it. But by drinking Lime-water, and waſhing the Parts affected with it, for three or four Weeks, ſhe had her Skin quite freed of any Eruption, and ſtill continues ſo; and now it is more than a Year ſince ſhe was cured." This by Mr *Peter Adie*, Surgeon. *Oct.* 20. 1757.

11. *Caſe* 10. Of many Inſtances which I could give of the good Effects of Lime-water, outwardly applied, particularly as a Gargariſm, I ſhall give only one, but a pretty extraordinary one, and communicated by the Patient himſelf, a Perſon of Quality, in theſe Words.
" I have been confined to the Houſe near three Weeks.
" I was ill when I ſet out for *Edinburgh*, and ſome time
" before, but I thought nothing of it. But what with
" Cold, Neglect, or perhaps fuller living, it turned to
" a very dangerous Affair. I have got ten times Phyſic
" in twenty Days, and that not weak. However, it
" did not ſeem to yield to any thing, till my Doctor
" thought of the Lime-water; which carried it off in
" a few Days, by waſhing *(the Mouth and Throat)* with
" it. Of this you may acquaint Dr *Alſton*. And that
" he may know the Diſtreſs, it was the ſame which the

“ old Phyſicians called the *Aphthæ*.” The Letter is dated *January* 12. 1757.

12. If to theſe be added, the Caſes of an obſtinate Dyſentery (*a*), of an inveterate ſcorbutic Humour in the Legs (*b*), and of epidemic Fevers (*c*), cured by Lime-water; the extenſive Uſe of it, as a Remedy for ſome of the moſt obſtinate Diſeaſes, muſt appear to be ſufficiently confirmed by Experience. I ſhall proceed therefore further to explain ſome Paſſages in the Diſſertations, beginning with what relates to the Action of Quick-lime on alcaline Salts (*d*).

SECT. II.

13. Why Quick-lime combined with alcaline Salts ſo highly increaſes their diſſolving and corroſive Qualities, is a Problem which few Chymiſts have attempted to explain (*e*): And I know no Experiments that bid ſo fair for a Solution of it, as thoſe of my learned Friend the ingenious Dr *Joſeph Black*, now Profeſſor of Medicine in the Univerſity of *Glaſgow*, which are publiſhed in the *Edinburgh Phyſical Eſſays*, *vol.* 2. *art.* 8. and ſeemed to command the Aſſent of every impartial Inquirer. Neverthele*ſ*s, having carefully peruſed this Article, ſome Objections occurred againſt his Theory, which I cannot anſwer, and which I ſhall therefore propoſe, to give him an Opportunity, when he has Time, to remove them.

“ I imagined,” ſays he, “ that when the calcarious
“ Earths are expoſed to a violent Fire, and thereby
“ converted into Quick-lime, they ſuffer no other
“ Change in their Compoſition, than the Loſs of a ſmall
“ Quantity of Water, and of their fixed Air. The re-
“ markable *Acrimony* which we perceive in them after
“ this Proceſs, was not ſuppoſed to proceed from any
“ additional Matter received in the Fire, but ſeemed
“ to

(*a*) Phyſ. Eſſ. 2. p. 257.
(*b*) Med. Obſ. 1. p. 286.
(*c*) Appen. to Diſſ. 1. No. 5.
(*d*) Diſſ. 1. p. 19. & 20.
(*e*) Diſſ. 1. p. 17. Diſſ. 2. Pref.

“ to be an eſſential Property of the pure Earth, depending on an Attraction for theſe ſeveral Subſtances which it then became capable of corroding or diſſolving; which Attraction had been inſenſible, as long as the Air adhered to the Earth, but diſcovered itſelf upon the Separation.——Crude Lime was therefore conſidered as a peculiar acrid Earth, rendered mild by its Union with fixed Air; and Quick-lime as the ſame Earth, in which, by having ſeparated the Air, we diſcover that Acrimony, or Attraction for Water, for animal, vegetable, and inflammable Subſtances.——If Quick-lime be mixed with a diſſolved Alkali, it likewiſe ſhews an Attraction for fixed Air, ſuperior to that of the Alkali. It robs this Salt of its Air, and thereby becomes mild itſelf; while the Alkali is conſequently rendered more corroſive, or diſcovers its natural Degree of Acrimony, or ſtrong Attraction for Water, and for Bodies of the inflammable, and of the animal and vegetable kind: Which Attraction was leſs perceivable, as long as it was ſaturated with Air.——If the Acrimony of the cauſtic Alkali does not depend on any Part of the Lime adhering to it, a Cauſtic or Sopeley will conſequently be found to contain no Lime,” *&c.* *(a)*. But it may be objected,

14. *1mo*, That the Acrimony of Quick-lime is here ſuppoſed to be much greater than it really is; for it is much milder than the alkaline Salts: Yea it does not appear to be of itſelf cauſtic; at leaſt I know no animal nor vegetable Subſtance that it can properly be ſaid to corrode, unaſſiſted by alkaline or ammoniacal Salts. It attenuates Oils, and viſcous animal Subſtances; but does not corrode the ſolid Parts, even of Animals *(b)*. It is ſaid indeed *(c)* “ to be too acrid to be taſted:” But that is to be underſtood of Quick-lime, ſo recently calcined, as to become burning-hot that Inſtant it is wetted. I once put a Bit of Quick-lime, in this State,

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(a) Phyſ. Eſſ. 2. p. 185.—195.

(b) Diſſ. 1. p. 16. 17. and below, N° 54.

(c) Diſſ. p. 16.

to the Tip of my Tongue, and might as well have touched a live Coal. But that Heat has nothing to do here, ſince ſlaked Lime may be as ſafely taſted as Lime-water; and yet ſlaked Lime, though nine or ten Months old, "will communicate to alkaline Salts a very high Degree of corroſive Acrimony" *(a)*, yea render them as corroſive as the moſt recent Quick-lime, ſo far as I could diſcover. Whatever Attraction therefore Quick-lime may have for fixed Air, it is not by it ſoon reduced to an inactive calcarious Earth.

15. *2do*, That there is no Lime in Sope-leys, ſeems to be inconſiſtent with Dr *Hales*'s Experiments; whereby he found, not only that Lime-water diſſolved or rotted the *Calculus*, and that the Efficacy of Sope lies in the Energy which Lime gives the lixivious Salts; but alſo, that when all the Lime is ſeparated from the Sope-leys, they are no better than diſſolved Potaſh: "I evaporated," ſays he, "to Drineſs, ſtrong Sope-leys, and took care to pour no more Water on the dry Salt, than had been evaporated away from it; whereby Regard was had to keep up a due Strength of the Sope-leys, which was alſo adjuſted, with great Accuracy, by means of an *Hydrometer*: Which Sope-leys diſſolved the Pieces of *Calculus* put into them, notwithſtanding they had been thus deprived of ſome of their limy Matter; and they retained a Power of diſſolving, after they had been thus deprived of more of their limy Matter a ſecond Time. But when I repeated the Evaporation and Filtration a third Time, they were ſo thoroughly purified from the Lime, that they had no more Effect in diſſolving a Piece of the ſame *Calculus*, than Ley of Potaſhes, neither in a warm digeſting Heat, nor in boiling for half an Hour" *(b)*. And it is no leſs inconſiſtent with the Experiments related in the ſecond Diſſertation *(c)*. Beſides,

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(a) Diſſ. 2. p. 64.—68.

(b) *Vid.* Exper. and Obſ. on Mrs *Stephens*'s Medicines, § 8. 10. 21. & 53.—56.

(c) No. 17. 18. 19. eſpecially 53. 54. 56. 59. 71. & 72.

That Lime does not conſtitute, at leaſt in Part, the neutral Salt got from Sope-leys, does not appear to be proved by Dr *Black*'s Experiments. It is true, he "concludes it to be a vitriolated Tartar, which, he "ſays, always accompanies the fixed Alkali of Vege-"tables" *(a)*. But this neutral Salt is almoſt, if not quite inſipid; and, without Ebullition, eaſily diſſolves in Spirit of Vitriol, as well as in a ſmall Proportion of cold Water: So differs much from vitriolated Tartar, "which requires a large Quantity of hot Water to "diſſolve it" *(b)*; eſpecially ſince a Solution of Pot-aſh, treated the ſame Way, leaves no Salt, but only a little alkaline Earth, which makes a ſtrong Ebullition with every Acid *(c)*. And that ſome of the Lime, by its Union with a fixed Alkali, ſhould acquire a ſaline Form, is not more ſtrange, than that ſome of the Chalk ſublimed with Sal Ammoniac, ſhould become a volatile Alkali *(d)*. But,

16. *3tio*, The cauſtic Alkali ſeems not to be deprived of fixed Air. For in that curious Experiment, whereby the Doctor produced Lime-water without Quick-lime, or rather Quick-lime without Fire; which he thus explains: "In this Experiment," ſays he, "the Air is "firſt driven out of the Chalk by an Acid, and the "Acid ſeparated from it by an Alkali, which has been "previouſly deprived of its Air; by which means the "Chalk itſelf is alſo obtained free of Air, or in an acrid "Form" *(e)*: I ſay, even in this Experiment, the Air is not driven out of the Chalk, nor the Chalk in this acrid Form free of Air; ſince it makes fully as great an Ebullition with Acids as does crude Chalk, as I found by repeated Trials; and conſequently contains as much Air, according to his Theory.

17. *4to*, If the cauſtic Quality of Sope-ley be owing to the Alkali's being robbed of its fixed Air, then one would think, that ſuch cauſtic Alkali's as are free of Air, or make no Ebullition with Acids, ought to be

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(a) Phyſ. Eſſ. 2. 203.

(b) Ibid. p. 162.

(c) Pref. to Diſſ. 1. p. 10.

(d) Macq. chym. prat. 2. p. 444.

(e) Phyſ. Eſſ. 2. p. 206.

more corroſive than ſuch as contain Air; whereas they are really leſs corroſive, or weaker: For Dr *Hales* found, that on dropping Oil of Vitriol into capital Sope-leys, which he bought of the Sope-boilers, an Efferveſcence was excited, till they were ſaturated therewith. “I dropt,” ſays he, “into two Ounces of Sope-leys “ſome Oil of Vitriol, till they were ſaturated therewith, ſo as to efferveſce no more; by which means “the limy Particles of the Sope-leys were precipitated “to the Bottom,” &c. (a.) I procured alſo ſome of the ſtrongeſt Sope-ley made in the Sope-work at *Leith*, dropt into a Glaſs of it the Spirit of Vitriol, as well as the ſtronger Oil; each of which excited as ſtrong Ebullition, as when dropt into a Solution of Potaſh. The ſaturated Solution continued quite clear and tranſparent; but the Sope-leys became muddy, and precipitated a Lime-like Subſtance, which ſmelled ſtrong of Sulphur.

18. The ſame were the Appearances, when the Experiment was made with the ſtrongeſt Sope-ley that I could prepare; yea and with every Sope-ley, when too great a Proportion of Lime was not taken: And if more Lime be taken than is neceſſary, the Lixivium cannot but be thereby weakened, on account of the greater Quantity of Water thereby required, as well as of the Salt retained in the Lime. Hence I found, that a Sope-ley made, according to Dr *Black*'s Proportions (b), of recent Quick-lime and pure Salt of Tartar, which muſt admit of more Lime than Potaſh, was much lighter than the *London* Standard (c); a Gill of it weighing ſcarce three Ounces ſix Drams and three Grains; whereas the ſame Quantity of the ſtrongeſt Ley from *Leith* weighed four Ounces and one Dram.

19. I know the ſpecific Gravity of the Doctor's cauſtic Alkali may be three Ways increaſed: 1*mo*, By adding to it ſome fixed alkaline Salt; and accordingly I put into a Gill of it, only half a dram of Salt of Tartar,

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(a) *Vid.* Exp. and Obſ. p. 11. N° 18. & 24.

(b) Phyſ. Eſſ. 2. p. 200. (c) Ph. Lond. p. 42.

But then it was no more the Doctor's cauſtic Alkali, ſince it made a briſk Ebullition with the vitriolic Acid. And it is alſo pretty remarkable, that this ſmall Quantity of the Salt diminiſhed the Pellucidity of the Lixive, and cauſed a viſible Precipitation; which muſt either come from the Salt, or there is Lime in his cauſtic Alkali's; ſince no ſuch Precipitation followed when the ſame Quantity of the ſame Salt was diſſolved in a Gill of pure Water. *2do,* To bring a light Sope-ley to the true Standard, it may be thrown on freſh Lime and Aſhes; as is obſerved in the *London Diſpenſatory* alſo. This Method I likewiſe tried, taking the half Quantity of the Lime and Salt firſt uſed, and keeping the Doctor's Proportions. But thus alſo it effervesced with Oil of Vitriol, as ſtrongly as if it had been Oil of Tartar; while its ſpecific Gravity was ſcarce ſenſibly increaſed. But, *3tio,* This may be effectually done by boiling down the Lixive. That both Weight and Strength of ſuch Lixives may be thus increaſed, is commonly known. But Dr *Black* "ſoon perceived, that no certain Judgment could be formed of the Strength of his Ley in this Way, becauſe it always abſorbed a conſiderable Quantity of Air during the Evaporation" (*a*). May it not therefore be inferred, that the Doctor's cauſtic Alkali muſt abſorb a conſiderable Quantity of Air before it become capital Sope-leys; that is, ſtrong enough for making Sope?

20. To aſcertain the comparative Strength of the Doctor's Ley, I took ſlaked Lime, which I had kept ten Months dry in a Stone Jar, and Pearl Potaſh, of each half a Pound; put them into three Pounds of Water; and after a Day's Maceration, filtered what I could pour off tolerably clear; and had about four Gills of Lixive, weighing ſixteen Ounces and two Drams; which made as ſtrong Ebullition with Spirit of Vitriol as any of the former: And having conveyed into the Filtre the *Reſiduum,* and drained off ſo much of the Ley as reduced the Lime into a pretty ſolid Lump,

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(*a*) Phyſ. Eſſ. 2. p. 201.

and infuſed it in two Gills of freſh Water, next Day got a Gill of a weaker Ley from it, weighing three Ounces ſix Drams and fifty-two Grains: So about fifty Grains *per* Gill heavier than the Doctor's cauſtic Alkali. Of this weak or ſecond Lixive I put a Spoonful into one Glaſs, and as much of the Doctor's cauſtic Alkali into another; and into each, in two Fragments, thirteen Grains of one and the ſame *Calculus*. When they had ſtood in the ſame Place forty-eight Hours unmoved, the Fragments in the weak Ley were reduced entirely to a Mucilage; whereas the Fragments in the cauſtic Alkali retained their Figure, the Surfaces being only cracked in ſeveral Places; and there remained ſix Grains of *Nuclei* as hard as ever. Hence the weak Ley appears to be near twice as corroſive as the cauſtic Ley. Ought not therefore their Names to be interchanged? Again,

21. 5*to*, It may be objected, That it does not appear certain, that the Ebullition proceeds ſolely from the Air fixed in the alkaline Salts or Abſorbents. Why may it not as well be fixed in the Acids? Becauſe "Acids and Air cannot be joined to the ſame Body at "the ſame Time" *(a)*. But they are conjoined in all acid Vegetables, in Vinegar, Tartar, Nitre, *&c.* yea in *Aqua Regia*: "For ſince Gold loſes nothing of its "Weight in being diſſolved in *Aqua Regia*, the Air-"bubbles cannot ariſe from the metalline Part" *(b)*. Even "the fuming Spirit of Nitre, and Spirit of Sea-"ſalt, abound with Plenty of Air" *(c)*. And that the ſtrongeſt Acids do not drive out the Air fixed in the Bodies they diſſolve, is confirmed by Experiment. For

I put into a little Phial, weighing, with the Cork, ſeventeen Drams and thirty-eight Grains, a fifty-two Grains Piece of a *Calculus*, and three Drams and two Grains of the Spirit of Nitre, corking it looſely, and giving Air frequently. Next Day the Ebullition being over, and the Fragment diſſolved, the corked Phial, with its Contents, weighed (in the ſame Scales, which were both ſmall and nice) twenty-one Drams and twenty-one Grains; that is, was only eleven Grains lighter than before the Solution. Theſe eleven Grains could not be all Air, becauſe the ſtrong Smell of the Spirit filled the Room near a whole Day; to ſay nothing of the viſible Vapour at firſt emitted, nor of what bubbled over during the Proceſs. But allowing them to be all Air, it is not the Half of the Air which fifty-two Grains of a *Calculus* contain, by many Experiments *(a)*. The ſtrong Acid of Nitre, therefore, cannot ſet at Liberty one Half of the Air fixed in human *Calculi*; but joins itſelf to it, as well as to the other Principles of the Stone. The diluted Solution I ſaturated with a Ley of Potaſh; but a very little of a mucous Subſtance only precipitated; which, ſeparated by Filtration, and dried, did not amount to a Grain. The filtered Liquor was of a pale orange Colour, but dyed Linens red; and expoſed to the Air in a Drinking-glaſs, in Time ſhot into very odd blood-red Figures on the Sides of the Glaſs; but at laſt loſt that Colour, and became tranſparent and cryſtalline.

(a) Phyſ. Eſſ. 2. p. 185.

(b) *Vid. Hales*'s Stat. Eſſ. vol. 1. p. 188. & 297.

(c) Ibid. 2. p. 310.

22. *6to,* Neither is it certain, that the fixed Air is driven out of the cauſtic Alkali when it makes no Ebullition with Acids. Some Leys efferveſce with Oil of Vitriol, but not with the Spirit; others with the Spirit of Vitriol, but not with the Spirit of Vinegar. So there may be no Ebullition, not becauſe fixed Air is wanting, but becauſe it is too fixed to be driven out by the known Acids; or an Acid ſtrong enough to ſet it at Liberty is wanting. And, which ſeems to determine the Queſtion, even Quick-lime, whether ſlaked or unſlaked, makes a ſtrong Ebullition in Oil of Vitriol, in Spirit of Nitre, and Spirit of Salt; conſequently, according to the Hypotheſis, the fixed Air is not ſeparated from it by Calcination, nor the Acrimony of Sope-leys owing to the want of Air. And it were pretty

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(a) Vid. Hales's Stat. Eſſ. 2. p. 191.

ſingular, if the ſame Degree of Heat which drives the fixed Air quite out of calcarious Earths, ſhould leave ſo much of it in alkaline Salts, while Quick-lime, even without Heat, can rob them of it. And,

23. *Laſtly*, It may be objected, That although it were granted, that crude Lime were a peculiar acrid Earth, rendered mild by its Union with fixed Air, Acrimony being the eſſential Property of the pure Earth; yet unleſs it be allowed alſo, that Acrimony is the eſſential Property of all pure Earths, it will not account for the Acrimony of the animal and vegetable Subſtances, which by Calcination can be reduced to Quick-lime. Is it the eſſential Property of the Juices which nouriſh the Shells of Eggs and Oiſters? Beſides, if fixed Air can render acrid Earths mild, why has it not this Effect on the Earth of alkaline Salts, which are allowed to poſſeſs a large Proportion of it, and yet are much more acrid than Quick-lime itſelf? I ſhall here only add, that ſince alkaline Salts and abſorbent Earths are commonly known by their Effervеſcence with Acids, ſuch Subſtances as do not thus act have been looked on as not alkaline. Hence the igneous Spirit of Sal Ammoniac is called by *Boerhaave* (a) *liquor volatiliſſimus omnium cognitorum, acerrimus omnium, neque tamen alcalinus*; whom I follow in the firſt Diſſertation (b), tho' fully as antacid as the common Spirit. And on the ſame Account it is ſaid (c), that Lime-water may be called antalkaline; ſince it placidly unites with Acids; but mixed with alkaline Salts, a Precipitation follows, though other Properties of an Alkali may belong to it in ſome Degree. But this by the by.

24. Dr *Black* having turned half an Ounce of Chalk into a kind of ſlaked Lime, by diſſolving it in Spirit of Salt, precipitating the Solution with twelve Ounces of his cauſtic Ley, filtering it, and drying the Precipitation on a Chalk Stone; while the Solution ſeemed not to require ſo much Ley to precipitate it, nor ſimple

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(a) Chem. 2. p. 333.

(b) P. 21.

(c) Ibid. p. 34.

Filtration and drying on Chalk appear to be ſufficient to free it of all the Ley; which adhering Ley might conſiderably affect the Experiment; I thought it might be of ſome Uſe to repeat it, with a few Variations. Wherefore,

25. *1mo*, I diſſolved two Drams of Chalk in about ſix Drams of *Glauber*'s Spirit of Salt, which was ſo well ſaturated, as not to redden the blue Paper; then I precipitated the Chalk, by adding four Ounces only of a weak Sope-ley to the Solution, which appeared to be too much: For when diluted with two Gills of freſh Water, it was not only ſo acrid as to inflame the Lips and Tongue, when, with the greateſt Caution, I attempted to taſte it; but alſo precipitated nothing when I added a little more of the Sope-ley. The four Ounces were therefore enough, yea more than enough, to precipitate all the Chalk: Which confirms what was ſaid above (*a*), of the Weakneſs of the Doctor's cauſtic Ley. The precipitated Chalk, ſeparated by Filtration, and well dried, weighed 108 Grains: So twelve Grains probably adhered, partly to the Veſſels, partly to the Paper, or might partly be owing to the Moiſture in the crude Chalk: For it could not be fixed Air ſet at Liberty, ſince the precipitated Chalk efferveſced as ſtrongly, even with Vinegar, as crude Chalk does. The acrid filtered Liquor, upon ſtanding two Days expoſed to the Air, had a Cream on it, but not a cohering Pellicle or Cruſt.

26. I put a Dram of this precipitated Chalk into three Gills of Water; next Day filtered off two Gills; it had the Taſte of Lime-water; and after two Days, one Gill of it (of the other afterwards) was covered with a thin Cruſt, but had loſt its Taſte. I added two Gills more of Water to the Chalk, and after two Days alſo filtered a Gill; which expoſed two Days to the Air, was covered with a Cream. I repeated this a third Time, and in four Days it was alſo cruſted. Then having poured off what was clear, I added to the *Reſiduum*

(*a*) § 12.—14.

two Spoonfuls of Sope-ley, and two Gills of Water; next Day filtered the Mixture, and waſhed and dried the Chalk, which weighed forty-nine Grains; and being put into Water, continued ſtill to communicate ſomething to it, which in two or three Days appeared like a Scum on the Surface. Into the other Gill of the firſt Infuſion I put an eight Grains Piece of a *Calculus*, which after three Days became white; but, after ſeven Days, had not loſt half a Grain of its Weight.

27. *2do*, Having formerly diſſolved Chalk in what I got for Spirit of Salt, and made alſo moſt of theſe Experiments with it, and with much the ſame Effect; though I found afterward it was rather a kind of *Aqua Regia*, becauſe it precipitated a Solution of Silver in *Aqua fortis*, and the Paper through which the precipitated Solution was filtered, flaſhed like Nitre in the Fire; this put me on trying, whether other Acids would anſwer as well as Spirit of Salt. Accordingly I made the Experiment with Spirit of Nitre, Spirit of Vitriol, and Spirit of Vinegar; but all without Succeſs. And,

28. *3tio*, To ſee if *Oleum Tartari p. d.* could ſupply the Place of Sope-ley, I precipitated a Solution of Chalk in Spirit of Salt with it; diluted and filtered the Mixture. What came through the Paper was milky and whitiſh; but being filtered a ſecond and third Time, it became clear like Water; and expoſed to the Air in a Tea-cup for twenty-four Hours, was covered with a tranſparent Pellicle; but the ſecond Water threw up nothing. Hence this notable Experiment is not to be explained by an Acid's driving the Air out of the Chalk; for Spirit of Nitre, or any other Acid as ſtrong as Spirit of Salt, would have done that as well. Hence alſo the Magiſteries of Coral, Pearl, *&c.* once famous Medicines in the Shops, ſeem not to have been uſeleſs Preparations; being not only reduced to more ſubtle Powders than they can be by Levigation, but alſo more ſoluble and abſorbent; and therefore leſs apt to form Concretions than the crude Subſtances are ſuppoſed to be.

29. It is obſerved in the firſt Diſſertation (*a*), that

"by

(*a*) P. 33.

" by boiling Lime-water, and expoſing it to the Air " for a ſhort Time, it may be reduced to ſweet Wa- " ter;" without determining how long it ought to be boiled or expoſed: This Defect may be ſupplied by the following, or ſuch like Experiments. I took three Gills of Lime-water of the firſt Infuſion, clear, but not filtered, that it might be as ſtrong as poſſible; decocted it, only for ten Minutes, in a cylindrical Tin Pan of five Inches diameter, and near three Inches deep; and then expoſed it to the Air in a Bowl, which can contain about an *Engliſh* Pint of Water: and although it was well covered with Paſteboard and Papers, in one Day's Time it ſcarcely taſted of Lime-water, and had only a duſty Scum, but no Cruſt, on its Surface. The ſecond Day it was quite ſweet, and free of Lime: For being filtered, and again expoſed for ſeveral Days, it threw up nothing; nor did diſſolving in it Salt of Tartar cauſe any thing like a Precipitation. Hence it appears, that if no more Quick-lime be taken than is neceſſary to preſerve the Water from Inſects and Putrefaction, or a Pound of good Stone Quick-lime for a Hogſhead of Water, decocting for a Quarter of an Hour or ſo, and expoſing for one Day to the Air, will render it fit for all the Uſes to which the common Element is applied *.

30. This Experiment alſo confirms what is once and again obſerved in the Diſſertations, to wit, that Lime-water expoſed to the Air throws up Cruſts or Cream, ſo long as there is any Lime in it; and alſo, when it throws up nothing, mixing Salt of Tartar with it can cauſe no Precipitation: For if it could happen otherwiſe in any Caſe, it would have happened in this, when nothing was thrown up ſo ſoon as the third Day, and the Lime, by boiling, might be ſuppoſed to be more intimately united with the Water than it can be by ſimple Infuſion. Yet, in further Confirmation, and on account of an Objection to an Experiment *(a)*, I made a new one,

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* See what is ſaid of the Magneſia in the Preface to the ſaid Diſſertation, § 2.

(a) Vid. Diſſ. 2. p. 21.

thus: I put three Gills of Lime-water of the firſt Infuſion into the ſame Bowl, covering it as above. When it had ſtood five Days, and been twice or thrice ſtirred, to break the Cruſts, during that Time, it ſeemed to throw up no more. However, I let it ſtand one Day more, then filtered, and found it as taſteleſs as common Water. In two Gills of this ſweetened Lime-water I diſſolved fifteen Grains of Salt of Tartar; but nothing like a Precipitation was viſible. In a Word, by all the Experiments that I have made, it appears, that Lime-water thus expoſed to the Air, commonly in five Days frees itſelf of all the Lime, if the Cruſts be now and then ſufficiently broken; though it may be kept good in cloſe-corked Bottles for ten or twelve Months; but how much longer, I know not.

31. That Quick-lime may be of great Uſe at Sea, and particularly in the Diſtillation of Sea-water, is taken notice of in ſeveral Places of the Diſſertations *(a)*. *Illi qui aquam marinam ſalubrem et potabilem reddere conati fuerunt*, ſays a very learned Author, *hanc imprimis difficultatem invenerunt, quod ingratum et ſubputridum ſaporem tollere non potuerunt: ſalem enim marinum, qui in hac aqua adeſt, inde ſeparare facile poterant (b)*. What it is that gives this diſagreeable and ſubputrid Taſte to diſtilled Sea-water, is not eaſily determined. It cannot be the Salt; for, by the ſevereſt Teſts, no Salt ariſes, though the Sea-water be diſtilled *per ſe*, or without any Addition. Nor does it appear to be an urinous Spirit; becauſe mixing Quick-lime with Sea-water, though boiling-hot, does not alter the Smell, nor diſcover any ſuch Spirit; and therefore making the Water boil any Time before the Recipient is applied *(c)*, can be of little Uſe. But if it be a bituminous Subſtance, I am apt to think, that Quick-lime, which is far more fixed and penetrating than Chalk *(d)*, and at the ſame time antiſeptic alſo, ſhould likewiſe more effectually prevent the riſing

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(a) Pref. to Diſſ. 1. p. 8.; Diſſ. 1. p. 33.; Diſſ. 2. p. 63.

(b) Van Swieten in Boerh. aphor. 3. p. 595.

(c) Diſſ. 2. p. 64.

(d) *Vid.* Phil. Tranſ. vol. 48. p. 830.

of ſuch Stuff, as well as correct the Taſte of diſtilled Sea-water; which it ſeemed to do in ſome Degree, in the imperfect Trials that I made (*a*). But mixing a little Quick-lime with the diſtilled Water, and again ſeparating it by boiling and Filtration, will do it more effectually. As for the Water diſtilled from Chalk, its Taſte was fully as diſagreeable as the Water diſtilled by itſelf.

32. Quick-lime retaining much longer its Qualities when it is ſlaked, or reduced to a Powder by throwing Water on it, than when kept dry, and falls down by what it imbibes from the Air; in comparing the Strength of Quick-lime with ſlaked Lime, Regard muſt be had to the Quantity of Moiſture retained in the latter, with which many of the Experiments in the Diſſertations were made. For if of ſlaked Lime a fourth Part, for Inſtance, be Water, it muſt require four Drams of ſlaked Lime to be equal in Strength to three Drams of Quick-lime. Thus, if a Dram of ten Months old ſlaked Stone-lime was ſufficient to make 387 Drams of Lime-water (*b*), eighty Grains of it would have made 516 Drams of as good Lime-water: Which eighty Grains, ſuppoſing it had been recently ſlaked, contained but about a Dram of Lime. Hence I was at ſome Pains to determine accurately how much Moiſture ſlaked Lime contained; and by Experiment found, that twenty-nine Ounces ſix Drams of recent Quick-lime being ſlaked, weighed two Pounds five Ounces two Drams; and twenty Ounces one Dram twenty-four Grains of Quick-lime ſlaked by the Moiſture of the Air, weighed twenty-eight Ounces and a half. I got it the Day it came in, *viz.* 13th of *July*; and it increaſed in Weight to *October* 7.; gaining in Weight the firſt ten Days four Ounces and an half, and the ſecond two Ounces and two Drams, and the third half an Ounce; yet continues ſtill increaſing in Weight. So that the Quantity of Moiſture in ſlaked Lime may be determined to be more than a fourth Part of the whole, when ſla-

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(*a*) Diſſ. 2. p. 33. (*b*) Ibid. p. 33.

ked in Water; but when in the Air, above a third; that is, a Dram of the firſt above twenty Grains; but of the latter, about twenty-ſeven Grains.

Alſo, to make ſome Diſcovery how much Time weakens ſlaked Lime, when expoſed to the Air, I put into ſix Gills of Water twenty-three Grains of ſlaked Lime, which I had kept dry forty-one Months; and into twenty-one Gills of Water, eighty Grains of ſlaked Lime only forty-nine Days old, both in corked Bottles. When they had ſtood a Week, and been every Day well ſhaken, and three Gills of each filtered, and expoſed to the Air for another Week, the firſt yielded of Cruſts 1¼ Grains, and the laſt ſix Grains. But if a fourth Part of each was Water, the firſt had eighteen Grains, and the laſt a Dram of Lime. The old Lime therefore yields but about a fourth Part of Cruſts, in compariſon of the recent, by this Experiment.

33. Though the Experiments which made me believe, that there are *Calculi* on which Lime-water can make no Impreſſion (a), did not prove it, yet I have ſince found it to be too true. For, in *December* 1755, I got from Mr *Adie* the Fragments of a Stone, weighing four Drams, which he took from a Boy about fifteen Years old. They were of a coarſe Grain, and not near ſo hard as the Stone wherewith I made moſt of the Experiments in the ſecond Diſſertation; and therefore broke in extracting. The Heart or *Nucleus*, as it were, was pretty entire, of a reddiſh brown Colour, rugged Surface, and about the Size of a Nut; the other Fragments more whitiſh in ſome Places, and reddiſh in others, conſiſting of two not very diſtinct Coats. A Piece of this Stone, of twenty Grains, I kept ſeven Days in a Glaſs of Stone-lime Water, and as long in Shell-lime Water; yet neither made any Impreſſion on it: Yea it retained its Size and Figure, when three Weeks ſoaked in a ſtrong Sope-ley, though penetrated thoroughly (b).

34. Hence we have one plain Reaſon of the Differ-

(a) Diſſ. 2. p. 12.
(b) Diſſ. 2. § 21. p. 15. and alſo Diſſ. 1. p. 40. § 9.

ence among Authors, concerning the lithontriptic Power of Lime-water; ſome affirming it abſolutely, and others denying it altogether; as the right or faulty Preparation of it, may well be reckoned another; the Directions for making it, even in the lateſt Diſpenſatories, being ſtill very defective (a). It is not pouring the Water on Quick-lime *paulatim*, *gradatim*, or *ſenſim*, and filtering when it has ſubſided, or letting it ſtand a Day, or two Days, before Filtration, yea nor boiling the Lime in the Water, that will make good Lime-water: For Water may ſtand ſeveral Days on the Lime without being impregnated, as is obſerved in the Diſſertation, as juſt now cited. And I lately ſet Water with much Lime in it on the Fire, and kept it boiling for ten Minutes; yet, when filtered, it neither had the Taſte of Lime-water; nor when expoſed to the Air for ſeveral Days, was it cruſted over, a thin Pellicle covering only Part of its Surface.

35. I know a learned Chymiſt ſays, that "the Water "ſhould be poured ſlowly on the Lime, otherwiſe a "muddy Subſtance forms upon the Outſide, which de"fends it from the Action of the *Menſtruum*;" adding, that "this Liquor ſhould be ſet in a cool Place, and "not kept too long; for, on long ſtanding, great Part "of what the Water had taken up from the Lime will "be ſeparated, in form of a fine white Cream" (b). But I have found by long Experience, that it is altogether indifferent whether the Water be poured ſlowly on the Lime, or all at once, or the Lime thrown into the Water (c); for it will be equally well impregnated, provided it be well ſtirred, not at firſt only, (that will not be enough), but at leaſt once more ſix or eight Hours after, and allowed to ſtand till it be cruſted over. And I can aſſure the Chymiſt, that Quick-lime ſo greedily drinks in Water, that no muddy Subſtance can be formed on its Outſide, or defend it from the Action of the *Menſtruum*; and alſo that Lime-water will keep as

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(a) Diſſ. 1. p. 28. and Diſſ. 2. § 38.

(b) New Diſpenſ. p. 397.

(c) Diſſ. 1. p. 29.

well in a warm as in a cool Place, a few Days only, if expoſed to the Air; but many Months, if ſufficiently defended from it *(a)*. "Though the making of the "*Aqua benedicta* is eaſy enough," ſays Dr *Quincy*, "yet "here in *London* it may be had at any Time from the "Sugar-bakers, by the Name of *Lime-water*, as wanted; becauſe they uſe it much in refining their Sugars." And below, "This indeed cannot properly be called "an officinal Water; becauſe the eaſy making or pro"curing it prevents its being kept in the Shops" *(b)*; that is, it is too vulgar and cheap a Water to deſerve a Place there. Hence perhaps it is, that the *Diſpenſatorium Ratiſbonenſe, an.* 1727, orders it to be made of Water diſtilled from Oak-leaves *(c)*.

36. The Inelegancy of Mrs *Stephens*'s Medicines for the Stone having occaſioned ſeveral conjectural Improvements, as well as dangerous Experiments, I formerly proved, that Sope-leys diluted with twenty Times their Weight of Water, are too acrid to be taken inwardly *(d)*; and I can now add, that thus diluted, they are a much weaker Lithontriptic than ſimple Lime-water. For a Piece of the hard *Calculus* often mentioned, of twenty-ſeven Grains, macerated a Week in about two Ounces of this diluted Sope-ley, was only whitened; but when waſhed well, and dried, had not loſt a full Grain in Weight. I found alſo, that Dr *Hartley*'s alkaline Emulſion *(e)* is not only much more nauſeous to the Taſte than Lime-water, but alſo far inferior to it as a Remedy for the Stone: For, by Experiments, it clearly appeared, that Lime-water penetrated the *Calculus* fully as much, in the ſame Time, as did an equal Quantity of the Emulſion, when but three Days old, and reckoned ſtronger than when expoſed to the Air for a Month. Now, if three half Pints of the Emulſion (the Doſe preſcribed by the Doctor being half a Pint, to be taken three Times a-day) be not more lithontriptic than three half Pints of Lime-water; ſurely

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(a) Diſſ. 1. p. 11.

(b) Q. Pharm. p. 350.

(c) Rieger introd. 2. p. 387.

(d) Diſſ. 2. p. 48.

(e) Ibid.

three Pints, or three Quarts of Lime-water, which can be taken with great Safety, might have double or quadruple the Effect of the three half Pints of the Emulſion. And that even Quick-lime itſelf, whether recent, or expoſed to the Air for ſeveral Months, is neither ſo ſafe nor ſo efficacious in the Stone as Lime-water, is demonſtrated, I think, in the firſt Diſſertation *(a)*.

37. And ſince, notwithſtanding the lithontriptic Power of the Urine of ſuch as take that Lady's Medicines, is ſtrongly aſſerted by her Partiſans, it has been found, that every one of the Patients, whoſe ſuppoſed Cure procured her the parliamentary Reward, had a Stone in the Bladder at, and conſequently to their Death, being all aged Perſons, in whom, even after Lithotomy, there is ſeldom, if ever, a new Stone formed; while all the Virtues of theſe Medicines are derived from the Lime; it appears to be abſolutely certain, that Lime-water is poſſeſſed of all the lithontriptic Powers of Mrs *Stephens*'s Medicines; and that, if taken in ſufficient Quantity, and ſo much *Alicant* Sope along with it, as will keep the Belly in its natural State, it will prove every way as ſucceſsful, and by far a more ſafe and agreeable Remedy for the Stone, than her nauſeous Preſcriptions, or any Reformation hitherto made, or perhaps that can be made of them.

38. That Lime-water does not break the Stone by deſtroying the *ſales calculi volatiles*, as Dr *Schloſſer* would have it *(b)*, nor by diſſolving the animal *gelatina*, to which the Coheſion of its Parts is aſcribed by Dr *Springsfeld (c)*, for Water might do that; nay nor by ſetting at Liberty, or driving out the Air, of which near one Half of the Stone is ſaid to conſiſt, ſeems to be proved already *(d)*, and confirmed by what follows. I took two pretty ſimilar Fragments of a *Calculus*, each weighing juſt five Grains; put one into half a Gill of

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(a) P. 40. N° 10. *(b)* Phil. Tranſ. vol. 49. p. 236.

(c) *Vid.* Got. Car. Springsfeld commentatio de prærogativa thermarum Carolinarum in diſſolvendo calculo veſicæ, præ aqua calcis vivæ, Lipſiæ 1756, in 4to, p. 15.

(d) Diſſ. 1. p. 39. 40.

Shell-lime Water, and the other into the ſame Quantity of Stone-lime Water, in Drinking-glaſſes covered with Paper. After ten Weeks, the Moiſture being evaporated, and the *Reſiduums* quite dry, each weighed ſix Grains and a half; that is, rather more than equal the Weight of both the Fragment and the Lime in the Water; there remaining of the Fragment in the Shell-lime Water unpenetrated two Grains and a half, and of the other two Grains.

SECT. III.

39. In the *Philoſophical Tranſactions* (a), there is a *Tentamen chemicum, de calcis vivæ actione in ſalem volatilem alcalinum,* by Dr *Schloſſer* of *Utrecht*; where, in a Note on p. 224. concerning the Queſtion, Whether the Precipitation on mixing Salt of Tartar with Lime-water comes from the Lime or the Salt? the Doctor gives his Opinion thus: *Quæſtionem certe hancce (quam minime parvo illorum experimentorum numero diremptam credo) e medio ſublatam fuiſſe, omnes procul dubio lætaſſent chemici, ſimulque actio calcis vivæ in alkali volatile facilioris forte reddita fuiſſet explicationis. Sed quænam quæſo eſt neceſſitas, ortum ejus pulveris e ſolo ſale ſolave calce repetere? cur partim ſalinæ, partim calcariæ originis eſſe non poſſet?* Bnt, even in the firſt Diſſertation (b), the Precipitation is only ſaid to be *chiefly* from the fixed Alkali. The Words are, "That the Precipitation was chiefly "from the fixed Alkali, I think more than probable; "becauſe the three Grains of the firſt Precipitation, was "more than double the Quantity of Lime contained "in three Spoonfuls of Lime-water" And had the learned Doctor ſeen the ſecond Diſſertation, he would not perhaps have thought the Experiments ſo few or inconſiderable; nor that we imagined, that the Powder proceeded *e ſolo ſale ſolave calce*; it being there owned, that commonly, if not always, Part of the *præcipitans*

(a) Vol. 49. p. 222. *&c.* (b) P. 20.

adheres to the *præcipitatum*; and conſequently that the Powder is *partim ſalinæ, partim calcariæ originis (a)*.

40. But the original Queſtion betwixt my Friend and me was, Whether the Lime-water or the Salt ought more properly to be called the Precipitant *(b)*? or whence comes the greater Part of the Precipitation; from the Salt, or from the Water? I own my Friend ſeemed to go further afterward, and think the Powder came entirely from the Lime-water; and that in conſequence of the Theory adopted by him, and by no leſs a Man than the celebrated Profeſſor *Hoffman*, as well as of ſome Experiments made by himſelf; which Dr *Black* alſo ſeemed afterward to confirm *(c)*; from whom however I have the Misfortune to differ: For to me the Precipitation appeared, by Experiments, to come, at leaſt ſometimes, chiefly from the Alkali, and differed from the calcarious Earth of the Lime-water *(d)*; though to define poſitively what Proportion of the Powder comes from the Lime-water, or from the Salt, when mixed as in the ſecond Diſſertation, N° 54. is not eaſy.

41. In order to throw ſome Light on this Queſtion, I kept ſome of the white Powder in a red-hot Crucible for above ten Minutes; which I thought would have reduced the Cruſts of Lime-water to Quick-lime; but the Precipitation was not thus calcined, ſo as to communicate any thing to the Water. But the white Powder being kept above an Hour in a more intenſe Heat, it was turned, at leaſt in Part, into Quick-lime: For three Drams of it being infuſed in about ſix Ounces of Water, it had next Day the Taſte of Lime-water, and was thinly cruſted over. Ten Grains of Salt of Tartar, diſſolved in a Gill of this Lime-water, yielded only one Grain and an half of white Powder. But becauſe this Precipitation was old, and had been collected at different Times, leſt any thing might have been

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(a) Diſſ. 2. p. 43.
(b) Diſſ. 1. p. 10. § 15. p. 20. § 6.; Diſſ. 2. § 59.
(c) Vid. ſupra, N° 15. *(d)* Diſſ. 2. ſect. 4.

accidentally mixed with it, I carefully prepared eighty-four Grains of it pure and unmixed.

42. Theſe eighty-four Grains of precipitated white Powder, being put quite dry in a Crucible, and kept red-hot in a ſtrong Fire for more than two Hours, became a ſolid Maſs, in Colour and Hardneſs not unlike common Chalk, but whiter, weighing only forty-ſix Grains; ſo diminiſhed thirty-eight Grains in the Fire: Since this white Powder can ſcarcely be ſuppoſed to have retained more Moiſture, when perfectly dry, than do the Lime-cruſts *(a)*. Of theſe thirty-eight Grains there could not be ſix Grains, at leaſt not eight Grains of Water; nor, ſince the remaining calcined Powder made as great an Ebullition with Acids as does common Chalk, could any conſiderable Part of the thirty-eight Grains be fixed Air. At leaſt, therefore, about thirty Grains of the Earth of this white Powder muſt have been driven away by Heat. And it being commonly known, that Lime is more fixed in the Fire than any alkaline Salt, is it not probable, that only the Earth precipitated from the Alkali could be thus diſſipated or driven away? So by this Experiment it appears, that more than a third Part of the Precipitation is from the alkaline Salt; when, to wit, for each Gill of Lime-water ten Grains of Salt of Tartar are taken *(b)*.

43. A Gill of Water being poured on this little Maſs of forty-ſix Grains, it did not grow hot, nor fall down like Quick-lime; yet next Day the Water had the Taſte of Lime-water, and was cruſted over. I filtered what I could pour off clear, and filled up the Tea-cup with freſh Water, having broken down the Maſs into ſmall Bits and coarſe Powder, and next Day again filtered, and filled up the Cup. This I continued to do for a Week or ſo, and afterward every ſecond or third Day, till I had collected above twelve Gills of this Lime-water; keeping always the ſame Filtre, but not the ſame Phial; and the very laſt Infuſion was cruſted, and taſted like the firſt: And having dried all

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(a) Diſſ. 1. p. 10.

(b) *Vid.* Diſſ. 2. Nº 57.

fully, I had of undiſſolved Lime remaining twenty-eight Grains, and of Cruſts in the Filtre twenty-five Grains, in all fifty-three Grains; that is, ſeven Grains more than the little Maſs weighed at firſt: Yet two Gills of the three firſt Infuſions, expoſed ſix Days to the Air, gave four Grains of Cruſts. Now, ſuppoſing the other ten Gills would have yielded twenty, or even fifteen Grains only of Cruſts, the Maſs of forty-ſix Grains, which ſhould have been reduced to twenty-ſeven Grains, on deducing the nineteen Grains of Cruſts, was increaſed to ſeventy-two Grains (a).

Into half a Gill of this Lime-water I put a Piece of the *Calculus* often mentioned, of twenty Grains Weight; and after three Days Maceration, it weighed very near nineteen Grains; which being treated again the ſame Way, in three Days loſt juſt one Grain. Hence it appears, that Water cannot take up near ſo much of this recalcined Lime as of common Quick-lime, perhaps little more than one Half of it. And is it not thence probable, that Part of this recalcined Maſs is alſo *ſalinæ originis?* Upon the whole, it ſeems not improbable, that by mixing Salt of Tartar with Lime-water in the above Proportion, more than one Half of the Lime in the Water is not precipitated, if ſo much (b).

44. Now, although it is not improbable, that, by repeated Calcinations, all the precipitated Powder may be ſo reduced into Quick-lime, as to be entirely ſoluble in Water; and though it ſhould alſo be granted to *M. Macquer*, that fixed Salts hinder the Calcination of calcarious Subſtances (c), which is not quite certain, as will appear below (d); yet it could not, with any Probability, be thence inferred, that all the precipitated Powder comes from the Lime. For it muſt be conſidered, that what is ſeparated from the fixed Alkali, even by repeated Solutions in common Water, or the Moiſture of the Air, as well as by Precipitation with Lime-water, is not a Salt, but mere Earth; and ſo

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(a) *Vid.* Diſſ. 1. p. 7. N° 11.
(b) *Vid.* Diſſ. 2. p. 16. N° 2.
(c) Elem. de chym. p. 54.
(d) N° 50.

could not obſtruct the Calcination of the calcarious Part, yea may itſelf be reducible into Quick-lime; eſpecially if *calx viva ſit vera terra alcalina, cujus debita cum aliis elementis unio, ſalem alcalinum fixum probet*; as Dr *Schloſſer* aſſerts (*a*). But whatever is in this,

45. It is certain, that Quick-lime mixed with diſſolved alkaline Salts, as in the Preparation of Sope-leys, diminiſhes conſiderably the ſpecific Gravity of the Solution, and conſequently ſeparates ſome of the more ſolid Parts of theſe Salts, whereby its own Weight is proportionally increaſed; as appears by Experiments (*b*), once and again, yea and a third Time repeated. And ſince Earth, if alkaline Salts be compoſed of different Principles, muſt be the leaſt active, there is, I think, Reaſon to conclude, that Quick-lime renders them more acrid, ſubtil, and penetrating, by ſeparating from them, or uniting to itſelf, Part of the Earth, than of their more active Principles, to which their ſpecific Qualities are owing; to ſay nothing of what it communicates to them of its own Subſtance (*c*).

46. And ſince Quick-lime acts thus on fixed alkaline Salts, it is not improbable, that it acts analogouſly on the volatile; not by ſeparating from them any Part of the Acid and Phlogiſton, as Dr *Schloſſer* would have it; ſince on the Union of theſe with the earthy Principle their ſpecific Properties depend. *Ipſo momento*, ſays he, *quo calcis vivæ particulæ, quæ in aqua calcis ſolutæ hærent, veri ſalis alcalini volatilis particulas tangunt, lacteſcentia fit, et calcis vivæ particularum præcipitatio ſequitur. Simul vero compages ſalis volatilis alcali in ipſa ſua textura diſſolvitur, acidi ejus, parcique phlogiſti ſui particulis, magna parte per præcipitatam calcem attractis, et cum eo coeuntibus, dum reliqua ſalis alcalini volatilis pars junctura* (jactura?) *longe acrior, et amiſſa quaſi corpore ſuo, vere ſpirituoſa reddita, ſpiritum igneum Boerhaavii verum conſtituit: qui igitur in eo tantum a vero ſale alcalino volatili differt, quod particulis hiſce acidi atque phlogiſti ſui maxima*

(*a*) Phil. Tranſ. vol. 49. p. 236.

(*b*) Diſſ. 2. p. 46.

(*c*) *Vid.* Diſſ. 1. p. 19. Nº 6.

parte privatus fuit, quibus debite reſtauratis, ſpiritus igneus verum in ſalem priſtinum totus quantus regenerabitur (a). Thus he.

47. If an igneous Spirit by an Acid and Phlogiſton had ever been turned into a volatile Salt, our Author's Hypotheſis would have ſome Foundation. But neither his own, nor *M. Du Hamel*'s Experiments (b), any way ſupport it, or make it at all probable; and he owns *quod reſtat probandum*, without attempting to prove it. Nor can I ſee any Relation between his numerous Experiments and his Hypotheſis, which is only a conjectural Explication of the Cauſe of the Precipitation on mixing volatile Salt with Lime-water; which he might have deduced, with as much Evidence, from the very firſt Experiment in the firſt Diſſertation (c); his other Experiments proving or illuſtrating nothing, that I can obſerve. So I may be allowed to ſay, *Quæſtionem hancce, magno ejus experimentorum numero, minime diremptam credo.* But to proceed:

48. Since at leaſt as much, or rather, as ſome Chymiſts aſſert, much more volatile Salt is obtained by ſubliming Sal Ammoniac with Chalk, than by the *intermedium* of a fixed Salt, yea and more either Way than the Weight of the crude Sal Ammoniac taken, Part of the Intermede muſt be volatilized, and intimately united with the true volatile Salt; and conſequently the one contains more Earth than the other; or what is carried up from the Salt, muſt be of the ſame earthy Nature with what riſes from the Chalk; which is not probable; theſe two volatile Salts differing much many ways, and particularly in Volatility. And ſince it is owned, that their Volatility and Acrimony are owing to ſomething elſe than the earthy Principle, I cannot but think, that the volatile Salt got by means of a fixed Salt, is more acrid than what is got by Chalk; and conſequently, that, not by increaſing, but by diminiſhing the Proportion of the Earth to the other Principles, the Acrimony

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(a) Phil. Tranſ. vol. 49. p. 234.

(b) *Vid.* Macquer chym. 1. p. 447. (c) P. 21.

and Subtilty of the volatile Spirits can be increaſed. And ſince a much ſmaller Quantity of Spirit can be obtained, by ſubliming Sal Ammoniac with Quick-lime, than any other Way, and always in a liquid Form, for want of a ſufficient Quantity of Earth, which the fixed Alkali, as well as the Abſorbents, afford, and is neceſſary to give a Body to the dry or ſolid Salt, but which the greater Fixity of Quick-lime hinders to ariſe; it appears to be far more probable, if not certain, that Quick-lime, in transforming volatile Salts into igneous Spirits, ſeparates ſome of the Earth, and not any Part of their other Principles. If Dr *Schloſſer* had diſtilled the Sal Ammoniac all the three Ways, and chymically examined and compared the Products, and other *phænomena*, he would probably have given a more ſatisfying Solution to this Queſtion than he has done. Whether either fixed or volatile Alkali's contain, or conſiſt of the Principles attributed to them by our Author and others, I leave to the Chymiſts to determine. But that Quick-lime ſeparates ſome Earth from volatile Salts, ſeems to be confirmed by the following Experiment.

49. I infuſed an Ounce of ſlaked Quick-lime in two Gills of Spirit of Sal Ammoniac, ſublimed from a fixed Salt, (each Gill weighing twenty-nine Drams), for fourteen Hours, mixing them well ſeveral times; and having poured off and filtered a Gill, found it weighed twenty-eight Drams and thirty Grains, or thereby: So diminiſhed in ſpecific Gravity about thirty Grains, or a fifty-eighth Part. And if the ſpecific Gravity of the igneous Spirit of Sal Ammoniac be to Water as 890 to 1000, as in Dr *Davies*'s Tables *(a)*; and of Spirit of Sal Ammoniac with a fixed Salt, as 952, as in the *New Diſpenſatory (b)*; the ſpecific Gravity of the common igneous Spirit, differs very little from that of the limed Spirit of Sal Ammoniac; and conſequently confirms the above Reaſoning. It was remarkable alſo, that tho' the filtered Spirit was at firſt clear like Water, it ſoon

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(a) Phil. Tranſ. N° 488. *(b)* P. 4.

became milky and opaque; but in a Night's Time clarified of itſelf, by precipitating Part, and throwing the reſt of the earthy Subſtances that muddied it, on the Sides of the Phial, to the Quantity of ſix Grains. Is it not therefore probable, that Quick-lime ſeparates from volatile Alkali's alſo Part of their earthy Principle?

50. To ſee whether alkaline Salts prevented the Calcination of calcarious Subſtances, I calcined, for four or five Hours, ſome of the Lime remaining of the Sope-ley mentioned above, N° 18. without waſhing it, and conſequently loaded with fixed Salt, and poured Water on it. This firſt Infuſion was a kind of Sope-ley; and ſo, though it ſtood ſeveral Days, it had but a thin Cruſt over it. But the ſecond Infuſion was much ſooner cruſted, and the third Infuſion in one Day's Time. And although the Alkali was Salt of Tartar, yet this recalcined *Reſiduum* became black, or rather of a very dark bluiſh green Colour, in the Water; which ſooner diſcoloured Silver, and had a more offenſive ſulphureous Taſte and Smell, than the Lime-waters made of ill calcined Oyſter-ſhells. Hence Salt of Tartar retains Sulphur, even after repeated Calcinations; but does not always hinder the Calcination of calcarious Earths.

51. The learned Dr *Springsfeld*, in his *Commentatio*, taken notice of above, N° 38. makes the Power of the *Caroline* Baths, or *Carlſbadt* hot Waters, in diſſolving the Stone, to be at leaſt ſix times ſtronger than that of Lime-water, though its Virtues as a Lithontriptic, ſeem to be owing entirely to the Lime in it. This little Commentary being rare here, the Experiments it contains curious, and the Facts almoſt incredible, ſome Account of them, with a few Remarks, cannot be unacceptable to the Reader. There are two of the Experiments which deſerve more particularly to be taken notice of. The firſt he thus relates. *Sumebantur tria fruſtula calculorum ſemidrachmæ ponderis ſingula. Ingerebatur quodvis in phialam vitream æque capacem. Uni affundebatur aqua calcis, ex ovorum teſtis nuperrime uſtis parata; alteri aqua thermarum; et tertio urina hominis eandem aquam quotidie bibentis, ante prandium reddita. Ponebantur*

bantur in loco tepido, ubi thermometrum Fahrenheitſianum ad gradus 96. *qui eſt calor ſanguinis humani, aſcendebat. Renovati erant liquores quotidie per* 14 *dies. Die* 15. *ponderabat fruſtulum ſiccatum ex aqua calcis grana* 29. *alterum ex aqua thermali gr.* 24. *tertium ex urina gr.* 25. (*a*). If the Fragments were of one and the ſame *Calculus*, the Egg-ſhells ſeem to have been ill calcined, or the Lime-water ill prepared; there being few *Calculi*, of which any right Lime-water, thus managed, would not have diſſolved into a Mucilage, more than five Grains in fourteen Days Time.

52. In the other Experiment, he took four equal Fragments of a *Calculus*, each weighing four Scruples; put them into Phials as above; pouring on the firſt Oyſter-ſhell Lime-water, on the ſecond the mineral Water, on the third the Urine of a *Boblinus*, that is, one drinking theſe Waters; and on the fourth the *urina hominis ſani*; placing the Phials and renewing the Liquors as in the former Experiment. After twenty Days, the Fragments being dried and weighed, the firſt had loſt almoſt three Grains, the ſecond eighteen, the third fourteen, and the fourth had gained three Grains (*b*).

Not to repeat what was ſaid on the former Experiment, it may be here remarked, that the lithontriptic Power of each of the firſt three Liquors in this Experiment, appears to be double to what it was in the former. For if Lime-water in fourteen Days diſſolved only one Grain, it would not in twenty Days diſſolve fully one Grain and a half; for 14 : 20 : : 1 : $1\frac{2}{5}$; and for the ſame Reaſon the Bath-waters would diſſolve about eight Grains and a half, and the Urine very little more than ſeven Grains. If this Difference is owing to the greater Solubility of the Stone, I may venture to affirm, that right Shell-lime-water thus managed would have reduced to a Mucilage, or waſhed away more than twenty Grains, in that Time, of ſuch a Fragment (*c*).

(*a*) Comment. p. 10. (*b*) Comment. p. 11.

(*c*) *Vid.* Dr *Whytt*'s Eſſay, p. 27. *&c.*; alſo a Note on p. 474. of the *Scots Magazine* for *Auguſt* 1757.

53. It may be obſerved alſo, that by theſe two Experiments, made when Dr *Lieberkuhn* was preſent, the diſſolving or lithrontriptic Power of the *Caroline* Baths, is much weaker than it appeared to be by thoſe made by the Author alone. For, according to them, a *calculus veſicæ* of two Ounces and a half, *lateritii coloris, in vaſe porcellana, prope ſcaturiginem fontis, ita poſitus, ut aqua calida continuo humectaretur, ſpatio ſex dierum erat diſſolutus. In fundo vero vaſis conſpiciebatur materia quædam alba, viſcida inſtar pultis, inter digitos enim ſentiri nequibat.* And another Stone weighing two Drams, *bodii coloris, torno quaſi politus, ſiliceæ fere duritiei, in aquam immerſus, ſacculo raro incluſus, mirum dictu! cæteris citius diſſolutus fuit* (this is a Miſtake). *Poſt* 24 *horas enim reſtabant duo tantum grana (a).* So that of this flinty Stone above ſix times more is diſſolved in one Day by the ſame Water, than was diſſolved by the Experiment N° 52. *ſupra,* in twenty Days. For, by the firſt Experiment, in the Order I mention them, there was not half a Grain of a Fragment of thirty Grains diſſolved in one Day's Time; by the ſecond, not fully a Grain of an eighty Grains Fragment; by the third, no leſs than 200 Grains of a Stone weighing two Ounces and a half; and by the fourth, 118 Grains of a Stone of two Drams Weight; all in the ſame Time, to wit, one Day. Here a very great Difference of the Effect of the ſame Waters on the *Calculi.* Can the Influence of the Air account for it *(b)*? Again,

54. Notwithſtanding the lithontriptic Power of the Urine of ſuch as drink theſe Waters, much inſiſted on by our Author, we find that a *Reverendus quidam,* even while he was drinking them, paſſed ſix Gravel-ſtones undiſſolved. Yea an *Illuſtris Comes,* whoſe Urine, made once a-day, on ſix Grains of ſmall Stones, formerly paſſed by himſelf, reduced them in eight Days to two Grains; even he paſſed ſome hard, though ſmall Stones, during the Uſe of the Waters; *largior quidem,* ſays he, *per duos treſve dies, hos ſubſecutus eſt* mictus ſanguinis, *qui*

(a) Comment. p. 7. & 8.

(b) Vid. Diſſ. 2. p. 13. N° 18.

tamen poſtea ceſſavit (a). One would think, that the Uſe of theſe wonderful Waters, for a very few Days, ſhould have diſſolved, or at leaſt ſo ſoftened or ſmoothed the Surfaces of theſe little Stones, as to prevent their cauſing bloody Urine for an Hour.

Experimentis indubitatis probavi, ſays he, *aquam thermalem ſemper abundare parte alcalina. Continet enim, præter ſalem medium amarum, quælibet libra aquæ tria grana ſalis alcalini, et decem grana terræ calcariæ, quare cum omnibus acidis effervеſcit.——Si per aliquot horas in balneis ſtetit, non ſolum lacteſcit ut aqua calcis, ſed illi innatat quoque cuticula tenera terrea, qualis ſuper aqua calcis obſervatur. Gaudet quoque ſapore illo leniter conſtringente atque exſiccante, ut parum abſit quin eam cum aqua calcis vivæ confunderes, niſi ſapor ſalſus aliquod leve daret diſcrimen (b).*

55. Hence it is not improbable, as I ſaid, that the Virtues of theſe Waters in the Gout, as well as in the Gravel, is owing chiefly, if not ſolely, to the Lime in them, of which they contain no more than does common Lime-water; and how they ſhould ſo much excel it in Virtues, is not eaſily explained: For I know no neutral Salt that has any Effect on the Stone, and fixed Alkali's very little. Far leſs can they improve the Taſte of the Water; of which Taſte the Author ſpeaks ſomewhat differently towards the End of his Commentary. For *tantum abeſt*, ſays he, *ut uſus thermarum Carolinarum* æque nauſeoſus ſit, atque aqua calcis vivæ, *ut potius, per* 6. 7. *&* 8. *menſes, ſine omni incommodo continuari poſſit; quod de aqua calcis vivæ affirmari nequit.* By what the Author ſays of the Lacteſcence and Taſte of his Lime-water, it ſeems to be very different from ours. For Lime-water here, if pure, ſoon gathers a Cruſt or Cream on its Surface, but never grows milky below. And as for the Taſte of ſimple Lime-water, rightly prepared, it is neither *conſtringens* nor *nauſeoſus* to me, nor to any one that will uſe it for a Day or two *(c)*, ſo far as I can find; yea I prefer its Taſte to that of pure Water,

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(a) Comment. p. 9.

(b) Ibid. p. 7.

(c) Vid. Diſſ. 2. p. 59.

ter, for common Table-drink; and as ſuch have uſed it, not only for ſeven or eight Months, but for eight or nine Years, *et ſine omni incommodo*. Nevertheleſs,

56. The *Caroline* Baths, being a natural compound *aqua calcis*, and ſo perhaps may ſurpaſs all the known artificial ones, I thought it not amiſs to attempt an Imitation of it; and into an *Engliſh* Pint of Lime-water put three Grains of the Salt of Tartar, and as much *Epſom* Salt. The Mixture became immediately milky, and ſoon precipitated. When pretty clear, I dropt into a Glaſs of it ſome Spirit of Vitriol, which clarified it fully, but without any viſible Ebullition. Into another Glaſs, containing about half a Gill of this Mixture, I put two Fragments of a *Calculus*, weighing together thirteen Grains. Next Day this compound Lime-water was not only covered with a Cruſt, but the Fragments alſo with numerous ſnowy Efflorescences, and to a conſiderable Thickneſs the Day following. At the End of the third Day, being waſhed and wiped dry, they weighed only nine Grains. So here, in three Days, four Grains were reduced to a Mucilage; whereas of a thirteen Grains Piece of the ſame *Calculus*, only two Grains and a half were thus diſſolved in a Week, either in Stone or Shell Lime Water (a). The Glaſs alſo was cruſted to the Bottom, which it never is with pure Lime-water. This appeared to be a conſiderable Diſcovery; and to aſcertain it the more, I put the remaining nine Grains of the two Fragments again into the ſame Quantity of the Liquor: But after ſeven Days Maceration, they had loſt but two Grains of Weight, ſeven remaining as hard as ever.

57. Not yet ſatisfied, I infuſed in the ſame Quantity of this compound Lime-water, fourteen Grains and a half of the ſame *Calculus*, in three Fragments; and the ſame Quantity of the ſame Stone, in three Fragments alſo, in a like Quantity of ſingle Stone-lime Water. And though the former appeared to be ſooner penetrated than the latter; yet, after three Days Maceration,

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(a) Diſſ. 2. N° 20.

being waſhed and dried, neither had loſt fully two Grains in Weight. Thus I compared alſo the Strength of ſingle Lime-water, with Lime-water in a Pint whereof only three Grains of Salt of Tartar were diſſolved, by infuſing in an equal Quantity of each the Remainders of the former Experiment, for three Days and ſix Hours; and the Appearances were much the ſame, neither having loſt two Grains fully. Here alſo the tartarized Lime-water cruſted the Glaſs to the very Bottom; which is the Reaſon perhaps that our learned Author makes his Bath-waters, on ſtanding, to turn milky. It does not therefore appear, that the lithontriptic Virtue of Lime-water, is either ſenſibly increaſed or diminiſhed, by diſſolving in it ſo ſmall a Proportion of Salt of Tartar, either by itſelf, or together with an equal Quantity of the *ſal catharticum amarum*, notwithſtanding the Precipitation; which may be a Diſcovery not quite uſeleſs, in ſome Caſes, nephritic particularly, accompanied with Inflammation or Coſtiveneſs.

58. But a Pound of *Epſom* Water, yielding at leaſt half a Dram of Salt, I diſſolved thirty Grains of this Salt, and three Grains of Salt of Tartar, in a Pint of Lime-water as formerly; and when pretty well purified *per ſubſidentiam*, put into half a Gill of it, an eighteen Grains Fragment of the *Calculus*. After three Days Maceration, the Fragment being wiped and dried, weighed more than 17¼ Grains; ſo loſt little more than half a Grain. The Precipitation, ſeparated by Filtration, being dried, weighed ten Grains: It was hard and brittle, and ſo chiefly from the bitter Salt. The remaining Fragment, put into pure Lime-water, tho' ſeven Days macerated in it, loſt nothing. *Epſom* Salt therefore ought not to be uſed along with Lime-water, if it be not in a very ſmall Quantity.

59. In the firſt Diſſertation (*a*), it is aſſerted, that a Piece of Veal buried in ſlaked Lime, in ten Days became as hard as a Mummy; and that it had the ſame Effect on Beef: Whereas a great Man ſays, "I put a

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(*a*) *Vid.* Note on p. 16.

" Piece of Veal, from half to three Quarters of an Inch " thick, into Chalk-lime, on the 10th of *May*; and on " the 31ſt of the ſame Month it had a putrid Smell, " and was in the Middle red and raw, with a thin hard " Outſide" *(a)*.

Although I had no Reaſon to ſuſpect the Accuracy of my Experiment, yet the Regard due to ſuch a Character obliged me to renew it. Accordingly I put a Piece of Veal, from five Quarters to two Inches thick, weighing 222 Grains, into ſlaked Stone-lime, on the 2d Day of *May* laſt. It had been kept ſome Days, and was beginning to ſmell. On the 4th it ſmelled more offenſively; on the 10th it had no Smell, and was pretty firm; and on the 12th of the ſame Month I took it out, and it was hard throughout, as a Horn almoſt, and weighed only ſeventy-one Grains. The Veal and Beef mentioned in the Diſſertation I keep ſtill, and they are as ſound and hard as ever; the former weighing thirty-ſix Grains, and the Beef 123. The Lime wherein all theſe Pieces of Fleſh were buried, was in a Stone Jar, wherein Raiſins are imported, and almoſt half filled it. There muſt therefore either be a very great Difference between Stone-lime and Chalk-lime, or the Chalk not completely calcined, or in too ſmall a Quantity.

60. Since it is certain, by many Experiments, made by others as well as by myſelf, that Lime-water powerfully reſiſts Putrefaction, as well as attenuates viſcous and ſizy animal Juices; it is not to be wondered at, that Fiſh or Fleſh long infuſed in it, though no wiſe corrupted, yet, when boiled, ſhould become very tender and pappy: Which explains, or rather confirms the Efficacy of this Liquor in Diſeaſes from Viſcidity of the Fluids. This is therefore ſo far from being a bad Quality, that it renders it many other ways uſeful *(b)*. Whether Lime-water's diſſolving the Texture of Fleſh into a Pap, muſt be the Effect of *unfetid Putrefaction*, or of ſome other Cauſe, I ſhall not inquire. Only, ſince

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(a) Phil. Tranſ. vol. 48. p. 830.

(b) Vid. Pref. to Diſſ. 1. p. ix. & p. 46.

this Solution is very analogous to the Change Fleſh muſt undergo in the Stomach, or before it becomes Chyle, and fit Nouriſhment for the Body, and conſequently a ſalutary, not hurtful Change; I am apt to think, that the Term *Putrefaction* muſt be taken in too large a Senſe, and diveſted of its common offenſive Signification, before it can here be properly applied.

S E C T. IV.

61. Although the Diſſertations could not fall under the Cenſure of the *Critical Reviewer*, yet Lime-water has not eſcaped it. "The eighth Article," ſays he, (of the ſecond Volume of the *Edinburgh* Eſſays and Obſervations, *&c.)*, "contains Experiments on *Magneſia alba*, which, though a faſhionable Purge, is a very inſipid, uncertain, ineffectual Medicine; and does more Harm by clogging and furring the Stomach and *primæ viæ*, than any Benefit that can be expected from the Uſe of it." In this Article, as there are many new and curious Experiments relative to the Hiſtory, Qualities, and Effects of this *Magneſia*; ſo, when judiciouſly adminiſtrated, it is neither an uncertain nor ineffectual Medicine. Its Inſipidity renders it more generally uſeful, becauſe eaſily taken; as its being diſſolvable in the weakeſt Acids, and purgative Quality, prevent its furring the Inteſtines. As to its Effects on Lime-water, which makes it of great Uſe at Sea *(a)*, it is taken notice of by the learned Author of the Article, as one of the ſingular Properties of this Subſtance. But the Virtues of that Liquor are foreign to his Subject, and untouched by him. Yet the Reviewer takes Occaſion thence to make a Fling at it.

"With reſpect to Lime-water," ſays he, "it is a *coarſe*, *inelegant* Preparation, and of very doubtful Efficacy, notwithſtanding all that has been ſaid in its Praiſe, by the Phyſicians and Chymiſts of *Edinburgh*. At the ſame time, we muſt allow, that in ſome Ca-

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(a) *Vid.* Pref. to Diſſ. 1. N° 1.

"ſes it has produced very ſalutary Effects" *(a)*. But with what Propriety a Liquor more tranſparent than Cryſtal, and more ſubtile and penetrating than pure Water, can be called a coarſe, inelegant Preparations is beyond my Comprehenſion. Nor can I reconcile its being of very doubtful Efficacy, with its having in ſome Caſes produced very ſalutary Effects, as in that of an inveterate Dyſentery, which he at length tranſcribes. Does he know any Medicine that produces very ſalutary Effects in all Caſes? or are all ſuch as do not, of very doubtful Efficacy? Had the Reviewer been tolerably acquainted with medical and chymical Authors, as *Willis*, *Bates*, *Le Febure*, *Morton*, *Boerhaave*, *Hoffman*, *Hales*, *Burlet*, *Cartheuſer Rieger*, &c. he might have ſeen, that the Phyſicians and Chymiſts of *London*, &c. have ſaid much in praiſe of Lime-water, as well as thoſe of *Edinburgh*; who, at the ſame time, may claim the Honour, of having made ſome uſeful Diſcoveries concerning its Nature and Effects. Nothing but Ignorance or Spleen can account for ſuch like Criticiſms, wherewith this ſecond Article in particular abounds, as muſt appear to every judicious Reader. But, for the ſake of ſuch as have not ſeen it, I ſhall give one other Inſtance of the Reviewer's learned Criticiſms, which adorn the ſame Page; where, criticizing on the ſecond Volume of the *Edinburgh Phyſical Eſſays*,

62. "The fourth Article on Light and Colours," ſays the Critic, "abounds with ingenious Obſervations; "though we apprehend ſome of the Author's Notions "are rather *fanciful* than ſolid. For Example, his "ſuppoſing that the Dew-drops upon Coleworts, and "other Vegetables, do not really touch the Surface of "the Plant, but hang over it by virtue of a repulſive "Power;—that the Needle is not in Contact with "the Water on which it ſwims;—that the differently-coloured Rays are projected with different Velocities from the luminous Body;—that the Cold on "the Tops of Mountains proceeds from the Diſtance

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(a) *Vid.* Critical Review, N° 5. Art. 2. p. 410.

" between thoſe Tops and the general Surface of the " Earth, *&c.*:" Which is all he has on this Article. Now, had this bold Critic conſidered, that the laſt Example is evident to common Senſe, that the firſt two are Sir *Iſaac Newton*'s Notions, and read *Monſ. Clairaut*'s Letter to the Royal Society *(a)*, he could ſcarce have had the Aſſurance to call at leaſt three of them rather fanciful than ſolid.

63. But the Diſſertations are directly attacked by a Reviewer at home, though ſo weakly, that I have been long in Suſpenſe whether or not to take any Notice of it. And really, in my own Judgment, it deſerves more to be deſpiſed than anſwered. Yet, in Deference to the Opinion of better Judges, who think my Silence may be miſconſtrued, I ſhall give the Article entire, with Annotations. It is the 5th Article of the *Edinburgh Review*, N° 2. and runs thus.

" This is the *laſt* Piece in a Controverſy betwixt Dr " *Alſton* and Dr *Whytt*, about ſome of the Properties " and medicinal Uſes of Quick-lime and Lime-water. " It has ſuch a Connection with the ſame Author's firſt " Diſſertation, and with Dr *Whytt*'s Eſſay, that *no* " *diſtinct Account* can be given of it ſeparately. But we " believe, that all *of* our Readers who attend to Sub" jects of this kind, have already had ſo much of the " Diſpute, that they will *excuſe us* from reviving it; " eſpecially as we ſhall have a better Opportunity to " entertain them on Quick-lime, when we come to con" ſider Dr *Black*'s Experiments, which are now in the " Preſs.

" We cannot however diſmiſs this little Piece, with" out taking notice of the Author's *Candour* in acknow" ledging his own Miſtakes. " On reviewing the firſt " Diſſertation, I obſerved," ſays he, " ſome Paſſages " in it which want to be *explained* or *corrected*." Then " follow two Pages of *Corrections* on the firſt Diſſerta" tion; and he writes a Preface to the ſecond, on pur" poſe to ſupply and correct ſome Defects and Errors

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(a) Phil. Tranſ. vol. 48. p. 776.

" which he obſerved in it after it was printed off: And
" at the End of this Preface he ſpeaks of his Antago-
" niſt in theſe Terms. " I cannot conclude without
" again owning, in Juſtice to the Eſſay, and to my
" worthy Friend the Author, that I ſtill eſteem it *as* a
" moſt uſeful and laborious Performance, which has
" done more good in the Stone and Gravel, than any
" thing formerly written on the Subject. It was the Eſſay
" chiefly that determined me to drink Lime-water, as
" well as directed to not a few of the Experiments,
" which I made with a View to improve the Doctor's
" Plan, and to confirm the extenſive Uſe of Quick-lime
" and its Water."

——— Hic nigræ ſuccus loliginis, hæc eſt
Ærugo mera. ——————— *Liberius ſi*
Dixero quid, ——————— *hoc mihi juris*
Cum venia dabis.

I may therefore be indulged the following Remarks.

64. That no diſtinct Account can be given of this little Piece ſeparately, muſt argue wonderful Sincerity or Attention; ſince he might have found one in the ſecond Page, where the Contents take up but about a Dozen of Lines. He has not therefore given a diſtinct Account of it, becauſe he could not, but becauſe he would not give it; chuſing rather, in direct Oppoſition to the Intention of the Undertakers, as well as to Truth itſelf, to give ſuch an Account as is much worſe than none at all. And if all of the Reviewer's Readers who attend to Subjects of this kind, think they have had enough, that is, too much, of the Diſpute already; they muſt be bad Judges, or have little Taſte either for curious or uſeful Knowledge. But I have Reaſon to think better of them, and to place this among the numerous Miſtakes crouded into this ſhort Article; which give little Ground to hope, that we ſhall be better entertained on Quick-lime when the Reviewer comes to conſider Dr *Black*'s Experiments. Eighteen or nineteen Months are elapſed ſince they were publiſhed; and yet the Reviewer has not embraced the Opportunity. Perhaps,

haps, on comparing them with the Diſſertation, he has found no Entertainment for himſelf; there being no Inconſiſtency between them of Conſequence. For whether there be any Lime in Sope-leys or not, it is agreed on both Sides, that the Acrimony of the Lixive is chiefly owing to the Change made on the alkaline Salt by the Quick-lime (a). Next,

65. The Reviewer is pleaſed to take notice of the Author's *Candour* in acknowledging his own Miſtakes: But he corrected them alſo; which might have ſaved the Reviewer the Trouble of mentioning them; corrected Miſtakes being no Miſtakes, nor any Piece the worſe of being corrected. Yet the Reviewer is pleaſed very ingenuouſly to multiply them: For inſtead of about two Pages of Corrections in the firſt Diſſertation, there are not two Lines of Miſtakes corrected; yea two Words are ſufficient to correct all the obſerved Miſtakes in them (b). For as to the firſt Article, it is certainly true Quick-lime, whether ſlaked or unſlaked, deſtroys all Acids; and alſo that it makes Ebullition, or efferveſces with Oil of Vitriol, Spirit of Nitre, and Spirit of Salt; that is, with all the ſtrong Acids, the weaker only being ſometimes abſorbed without Ebullition. So inſerting the ſingle Word *ſtrong* before *Acids* makes all the Correction deſigned. The ſecond Article is owing to the Regard due to the Experiment of a very great Man. The third is a new Diſcovery; and all the three rather explicative than corrective. The fourth Article contains Experiments, but no Corrections, though it takes up three half Pages. And inſerting the Word *bitter* before Sea-ſalt, corrects the Miſtake on the laſt Article. I would willingly believe, that the Reviewer never read theſe two Pages, as the only Excuſe ſo groſs a Miſrepreſentation of Facts is capable of, were it not that his Words diſcover the Deſign: For after quoting from the ſecond Diſſertation, that ſome Paſſages in the firſt wanted to be *explained or corrected*, he very candidly adds, " Then follow two Pages of *Corrections* on the firſt

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(a) *Vid.* Diſſ. 1. p. 17. N° 4. et ſupra, N° 15.

(b) *Vid.* Diſſ. 2. p. 62.

"Diſſertation;" taking no notice of the *Explications*, of which they almoſt entirely conſiſt. With the ſame Ingenuity he brings in the Preface to the ſecond Diſſertation, as if it were full of Errors: Whereas,

In that Preface there is only one Miſtake corrected, which the ſingle Word *dele* might have done. But it being more inſtructive plainly to account for the Miſtake, and to give the Experiments correcting it, with their Uſe, Half a Page is thus employed. As for the other three Pages of the Preface, they are left to the Reviewer's Correction; and I believe he will acquit them, if not on account of the Diverſion they muſt give him, when he is about to entertain us on Quick-lime; at leaſt for the ſake of the Concluſion, the greateſt Part whereof, though quite foreign to the Subject of the Diſſertation, he has *verbatim* tranſcribed, throwing in only a monoſyllable Conjunction, where it was not wanted, and no doubt would willingly make it paſs for a Palinodia. But,

66. All the Author deſigned by it was to ſhow, that however much he might differ in ſome Things from his worthy Friend, yet he was by no means blind to his Merits. An Eſſay may be ſignally uſeful, though not abſolutely perfect; yea Miſtakes have many times been the Occaſion of very beneficial Diſcoveries. It was a Miſtake that diſcovered the Virtues of Lime-water in an epidemical Fever *(a)*; and the now ſo common Uſe of it in the Stone and Gravel, and conſequently the aſcertaining the Good it does in theſe Diſeaſes, is owing perhaps more to a Miſtake in the Eſſay, than any Truth therein contained. For though Dr *Hales* proved by Experiments the lithontriptic Power of Lime-water, and the Experiments, with *David Millar*'s Caſe, in the Eſſay notably confirmed it; yet the Time it takes to produce any Effect, the Pain and Uneaſineſs ſometimes accompanying the Uſe of it, and the little Succeſs often attending it, could not but be very diſcouraging. But when it came to be generally believed, that the

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(a) Vid. Diſſ. 1. p. 75.

Stone-breaking Virtue of Shell-lime Water was near three times greater than that of Stone-lime Water, and alſo that it was, by far, the ſafeſt of the two; I know no Fact could ſo effectually determine every nephritic Perſon, to have Recourſe to it as a divine Remedy. And I am credibly informed, that there has been more Lime-water made uſe of in *London* and *Edinburgh*, in one Year, not long after the Publication of the Eſſay, than in almoſt Half the Century preceding. But if this Miſtake be diſcovered, and Stone-lime Water found to be as efficacious and ſafe, in every Diſeaſe, as Shell-lime Water, eſpecially if on other Accounts preferable; can the Reviewer ſay that it ought not to be corrected, or that ſo uſeful a Truth ought, on any account, to be concealed? Yea allowing it to be doubtful on which Side the Truth lies, can there be a more effectual Way taken to diſcover it, than by making the Arguments on both Sides public? Beſides, it was this, and ſuch like Miſtakes, whether real or imaginary, which led to the Experiments, whereby not a few curious, as well as uſeful Truths, were brought to Light, which otherwiſe probably had never appeared. Such Controverſies therefore, or Diſputes, contributing to mutual Improvement, inciting to Diligence in the Advancement of Science, and of the public Welfare, and altogether conſiſtent with the ſincereſt Friendſhip, never were, nor will be diſcouraged by any Lover of Learning.

FINIS.

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CORRIGENDA in the NOTES.

Pag.	*lin.*	
9.	2.	*for* 54. *read* 59.
Ibid.	ult.	*after* Diſſ. *add* 1.
10.	1.	*for* p. *read* N°.
21.	ult.	*for* 33. *read* 63.

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